Agricultural Extension Service ● University of Minnesota

FACT SHEET

MN 2000 FSS 1

# Nitrogen Fertilizers Help Increase Yields

SOILS NO. 1—REVISED 1974

JOHN M. MACGREGOR

Why do Minnesota soils need nitrogen? Because for nearly a century we have cultivated that soil, taking a little more nitrogen with each crop. Now only a small amount of nitrogen is available to crops. For this reason, applications of nitrogen fertilizers often result in big increases in crop yields.

Nitrogen applications often produce larger increases in crop yields than do phosphorus or potassium (see photo below). Realizing the importance of nitrogen, Minnesota farmers increased the amount of nitrogen in fertilizers they used from 500 to 400,000 tons during the last 30 years. Several different nitrogen fertilizers are now available in Minnesota. So the question remains, "Which is the most practical fertilizer for me to use?" The following information can help you answer this question and others concerning these fertilizers. Specific recommendations on rates to use per acre are available through the soil testing program.

### Which Nitrogen Fertilizer To Use

When you look for the proper nitrogen fertilizer, consider four factors:

1. How much does it cost per pound?
2. How much does it cost to apply?
3. Will equipment be available when I want it?
4. What advisory service will I have?

No one nitrogen fertilizer form is better than another for producing high yields. Therefore, you need not consider effectiveness when choosing a form. But good advice on the rate, time, and method of application is important to your decision.


Fertilizer effect on excellent but fertility depleted soil in south-central Minnesota.

Nitrogen fertilizer is sold as a solid, a liquid, or a gas. The amount of nitrogen contained varies from 20 to 82 percent. Each form requires special distributing equipment. The forms commonly available include:

Solid materials:
Ammonium nitrate
Ammonium sulfate
Urea
Liquid materials:
Nitrogen solutions — 20 percent nitrogen
Nitrogen solutions — 32-41 percent nitrogen
Aqua ammonia — 20 percent nitrogen
Gaseous materials
Anhydrous ammonia — 82 percent nitrogen

Large amounts of nitrogen also are sold in the form of mixed fertilizers.

### Be Sure Nutrients Are Properly Balanced

At least 16 nutrient elements (such as calcium and magnesium) are known to be needed for normal plant growth. A shortage of any one of these elements at any time in the plant's life may seriously limit crop production.

For most Minnesota crops, the soils supply enough of all these elements except nitrogen, phosphorus, and potassium. But, remember that adding nitrogen to the soil increases crop growth. And this increased growth removes extra phosphorus, potassium, and other elements from the soil.

If there isn't enough of any of the 16 essential elements available in the soil, plants cannot develop normally. Therefore, low yield and quality result. If you are considering applying nitrogen, have your soils tested to be sure the soil contains sufficient phosphorus and potassium. Furthermore, zinc is now needed in localized areas of high-lime soils in western Minnesota.

### Nitrogen Fertilizers Increase Soil Acidity

Most nitrogen fertilizers used in Minnesota produce a gradual — but small — increase in soil acidity. The following table shows the number of pounds of pure lime needed to neutralize each pound of nitrogen contained in different nitrogen fertilizers.

### Nitrogen Content And Acid Effect Of Some Nitrogen Fertilizers

| Fertilizer | Percent nitrogen | Lime needed to neutralize 1 pound of nitrogen (pounds) |
|---|---|---|
| Solids: | | |
| Ammonium sulfate | 20.5 | 5.4 |
| Ammonium nitrate | 33.5 | 1.8 |
| Urea | 45.0 | 1.8 |
| Liquids: | | |
| Nitrogen solutions | 20-41 | 1.8 |
| Aqua ammonia | 20 | 1.8 |
| Gas: | | |
| Anhydrous ammonia | 82 | 1.8 |

Each pound of nitrogen applied in five of the fertilizers produces soil acidity requiring 1.8 pounds of pure lime for neutralization. For example, if you use these fertilizers to supply 100 pounds of nitrogen per acre annually for 10 years, you would need about 1 ton of lime to correct the acidity.

### When To Apply Nitrogen

Crop plants use rather small amounts of nitrogen during early growth, but their needs rapidly increase after the first month. For this reason, applying nitrogen after the crop is up has become a common practice. You can either sidedress or topdress the fertilizers.

You probably know that sidedressing row crops in the early growth stages with nitrogen increases crop yields. But nitrogen applied in early spring before seeding – or even the previous fall – increases yields just as much except on sandy soils. Apparently, soils of medium to heavy texture hold the nitrogen fertilizer and release it to the plants when needed.

When you apply nitrogen in the fall, incorporate it into the soil the soil to prevent losses. Excessive late fall or early spring rain may cause a slight loss of fall-applied nitrogen, even on heavy soils. Plant corn as early as possible to obtain maximum benefits from nitrogen fertilization.

### Danger In Using Nitrogen Fertilizer

Most nitrogen fertilizers used on Minnesota farms are relatively concentrated and will burn seeds or plants if they contact them. Never place these fertilizers nearer than 1 inch to the seed. Place highly concentrated forms of nitrogen fertilizer, such as anhydrous ammonia, even farther away.

Nitrogen dissolves in water and moves easily in the soil with moisture movement. Therefore, you don't have to place it close to growing plants.

### Does The Effect Last?

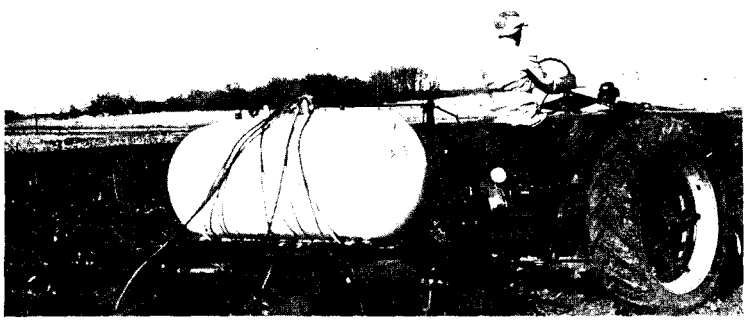
Naturally, the effect of nitrogen is greatest on the first crop – yields generally jump. However, an effect is often carried over to crops grown on the same land for one or more following years.

The lasting effect depends on the original rate of nitrogen application, the soil's need for nitrogen, and the yield of the first crop produced. If you apply 40 pounds or less of nitrogen per acre, the carryover effect may not be noticeable. Highly productive soils are less likely to show a response after the first year than are lower producing soils.

Under right conditions, the carryover effect on the second crop can even be great enough to cover the cost of applying the fertilizer. It pays to fertilize.

### Tips On Nitrogen Fertilizers

1. Buy nitrogen by the pound.
2. Consider application cost.
3. Apply before July, if possible.
4. Balance nitrogen with phosphorus and potassium.
5. Measure by yield – not appearance.
6. Apply on crops like corn – not legumes.
7. Be sure the plant population is sufficient to use the nitrogen.
8. Apply at least 1 inch from the seed.



**Special application equipment is necessary for knifing anhydrous ammonia into the soil. Much the same equipment is used for liquid nitrogen solutions and aqua ammonia.**

**Solid nitrogen fertilizers can be broadcast or applied later as a sidedressing.**



Issued in furtherance of cooperative extension work in agriculture and home economics, acts of May 8 and June 30, 1914, in cooperation with the U.S. Department of Agriculture. Roland H. Abraham, Acting Director of Agricultural Extension Service, University of Minnesota, St. Paul, Minnesota 55101.